

# EMAT 4500 Connections in Secondary School Mathematics Syllabus, Spring 2007

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Office hours by appointment. Please call or e-mail.

**Course description.** This course is about connections within and across mathematics and about connections between mathematics and contexts outside of mathematics. We will be looking in particular for opportunities to think about high school mathematics more deeply and more broadly and in ways that take advantage of the undergraduate mathematics courses you have taken or are taking.

**Course Structure.** The course will consist of homework assignments, two midterm exams, and a final project. The bulk of the course will be organized around approximately four topics. For each topic, there will be mathematical problem sets, research assignments such as exploring the development of the topic in various textbooks, and reflective writing assignments. Some of these assignments will involve analysis or elaboration of the new Georgia Performance Standards. The intent of the final project is a similar exploration of a topic of your choosing.

## Proposed Topics

- Calculus and the mathematics of change
- Number systems and their extensions
- Exponents, logarithms, sequences, and series
- Combinatorics, discrete mathematics, and probability

## Themes

- Reasoning. Mathematics involves understanding why statements are true and why procedures produce correct answers. You should have two explanations whenever possible.
- Problem solving. Mathematics involves solving problems you haven't seen before. (How might you distinguish between problems and exercises?)
- Connections. The power of mathematics arises from the fact that apparently different problems can have the same solution. (How is a solution different from an answer?)
- Representations. Mathematical thinking and communication involves representations of mathematical ideas. You will explore ideas graphically, numerically, symbolically, and in contexts, and you will make explicit connections between and among the representations. (Why are two representations better than one?)
- Definitions and conventions. Mathematical thinking and communication is facilitated by agreeing upon definitions and conventions. (How should definitions be used? Can definitions or conventions be proven?)

## Homework

The homework problems are intended to help you develop good explanations for mathematical ideas. Thus, an answer alone will receive little credit, and an algebra-only solution will be considered incomplete. Use words in between the symbols, write in complete sentences, and be sure to include enough explanation so that a classmate could understand your reasoning.

You are encouraged to collaborate with your classmates on the homework, but when you sit down to write up a problem, you should work on your own. And as you collaborate, be sure to give yourself plenty of time to think through each problem yourself. The point is that you will often deepen your understanding as you try to write a careful explanation, and you will learn little by merely reading someone else's solution.

Most of your homework problems will be graded on the following rubric:

- 5 Exemplary response demonstrating solid understanding and insight.
- 4 Satisfactory response demonstrating the gist of the idea.
- 3 Almost satisfactory response with insufficient detail.
- 2 Deficient response demonstrating little grasp of the key ideas.
- 1 Failing response.

This rubric maps naturally onto the letter-grades A through F. Note that this rubric does not conform to the stereotypical percent-grade equivalents (90s are As, 80s are Bs, etc.).

**Resources.** Many textbooks are available in the bookcases and cabinets in Aderhold 111. Please do not remove these from the room. Additional resources are available in the curriculum library on the second floor of Aderhold. Effective teachers make liberal use of materials and resources provided in textbooks, on the Web, by colleagues, or via handouts from presentations. Such materials are not used directly but rather are modified to fit the particular circumstances for which the teacher intends to use them. We expect that you will do the same in this course and, in addition, that you will cite your sources.

**Textbooks and materials.** There is no official textbook for the class, though we suggest that you own a copy of the *Principles and Standards for School Mathematics* (NCTM, 2000). We also reserve the right to require or recommend books as the term progresses. We also ask that you have a graphing calculator and bring it to class. We recommend a TI-83 or better.

#### Course products and weight

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|---------------------|-----|
| Graded assignments: | 30% |
| Midterm exams:      | 40% |
| Participation:      | 10% |
| Final project:      | 20% |

**Final project.** The project is intended to allow you, in groups of 2-3 people, to explore a specific topic in depth and to give a presentation to the class during the scheduled final exam time. Your project should be typed and 1 1/2 or double-spaced. If you do not know how to incorporate Excel tables, graphs, Equations, or GSP drawings into the file, please let us know. More detail is forthcoming.

**Memberships.** We suggest that you join the National Council of Teachers of Mathematics (NCTM) and subscribe to the *Mathematics Teacher*. Student membership is \$38, and you may join online at <http://www.nctm.org>. It is also a good idea to join the Georgia Council of Teachers of Mathematics (GCTM). See <http://www.gctm.org>. Student membership is free for juniors and seniors. We expect that you are already a member of UGA's Mathematics Education Student Association (MESA). See <http://www.ugamesa.org>.

**NCTM in Atlanta.** This spring the Annual Meeting of the National Council of Teachers of Mathematics is in Atlanta from March 21-24. EMAT 4500 will not meet on Thursday March 22 so that you can attend this meeting.